



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
**30.07.2003 Bulletin 2003/31**

(51) Int Cl.7: **F01L 9/04**

(43) Date of publication A2:  
**11.12.2002 Bulletin 2002/50**

(21) Application number: 02012618.1

(22) Date of filing: 06.06.2002

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU**  
**MC NL PT SE TR**  
 Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventor: Yanai, Akihiro  
Toyota-shi, Aichi-ken 471-8571 (JP)

**(74) Representative:**  
**Leson, Thomas Johannes Alois, Dipl.-Ing.**  
**Tiedtke-Bühling-Kinne & Partner GbR,**  
**TBK-Patent,**  
**Bavariaring 4**  
**80336 München (DE)**

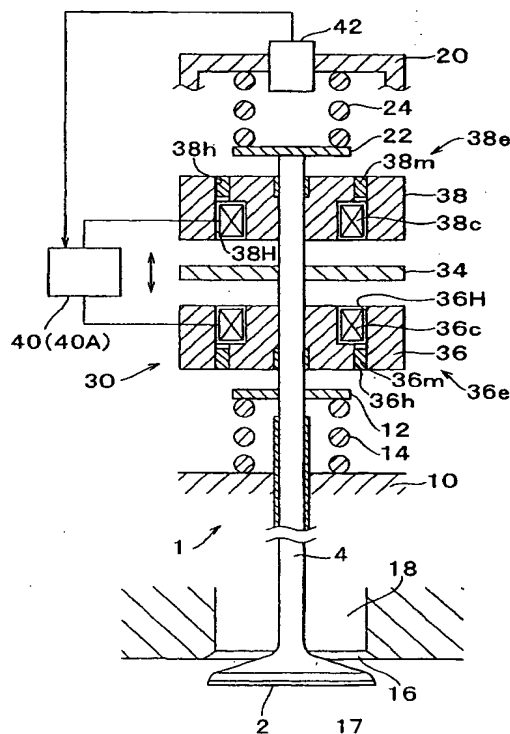
(30) Priority: 08.06.2001 JP 2001173328

(71) Applicant: **TOYOTA JIDOSHA KABUSHIKI  
KAISHA**  
**Aichi-ken 471-8571 (JP)**

(54) **Apparatus and method for detecting change of neutral position of valve of electromagnetic valve actuation system, and apparatus and method for controlling the valve**

(57) A valve (1) is urged in the valve-opening direction by an upper spring (24) and in the valve-closing direction by a lower spring (14). The valve (1) is thus urged to a neutral position where the respective urging forces are balanced. The valve (1) is controlled to be released from one of two terminal positions, that is, the full-open position or the full-closed position, and to be attracted to the position from which the valve (1) has been released. The displacement pattern of the valve during this period is sensed by a displacement amount sensor (42), whereby the maximum displacement amount of the valve (1) from that terminal position is measured. The change of the neutral position is detected based on the change of the measured maximum displacement amount with respect to a reference value.

FIG. 1





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 02 01 2618

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.C1.7)
A, P	EP 1 136 659 A (NISSAN MOTOR) 26 September 2001 (2001-09-26) * paragraphs '0006!', '0007!'; claims; figures *	1, 11	F01L9/04
A	US 5 775 278 A (SUGAI TAKASHI ET AL) 7 July 1998 (1998-07-07)		
			TECHNICAL FIELDS SEARCHED (Int.C1.7)
			F01L
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>10 June 2003</b>	Examiner <b>Klinger, T</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 01 2618

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-06-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1136659	A	26-09-2001	JP 2001207876 A	03-08-2001
			EP 1136659 A2	26-09-2001
			US 2001027759 A1	11-10-2001
US 5775278	A	07-07-1998	JP 8004512 A	09-01-1996
			JP 7335437 A	22-12-1995
			JP 8021220 A	23-01-1996
			US 5636601 A	10-06-1997
			US 5799926 A	01-09-1998
			US 5799630 A	01-09-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**THIS PAGE BLANK (USPTO)**